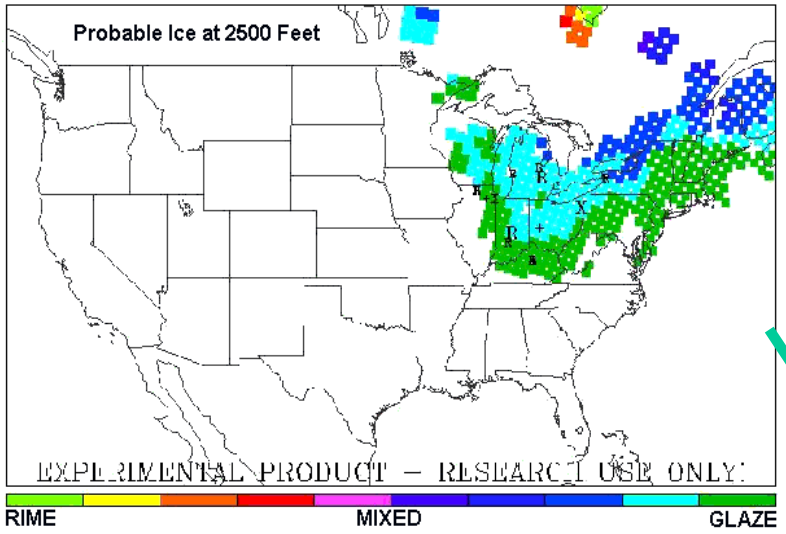
Weather Accident Prevention Project Review
Aviation Weather Information Network

Nov. 20th-21st, 2002

Weather Hazard Information System: Reducing General Aviation Fatal Weather Related Accidents

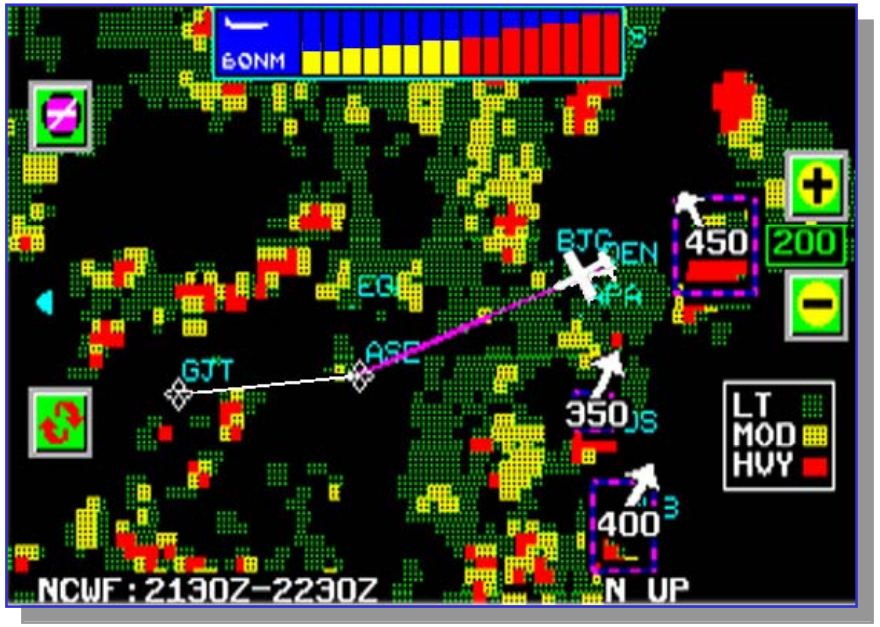
Frank Williams
ARNAV Systems, Inc



experimental product - research use only

GOAL - Take Experimental weather products and create...

weather products certified for airborne use, including CFIT protection



Pre-2002 Accomplishments

- Developed new weather products designed specifically for transmission to aircraft
- Developed TCP/IP distribution system
- Established requirements for certification of weather products through RTCA committees
- ARNAV was awarded FAA Flight Information Services (FISDL) Contract and certified first NEXRAD / METAR weather products

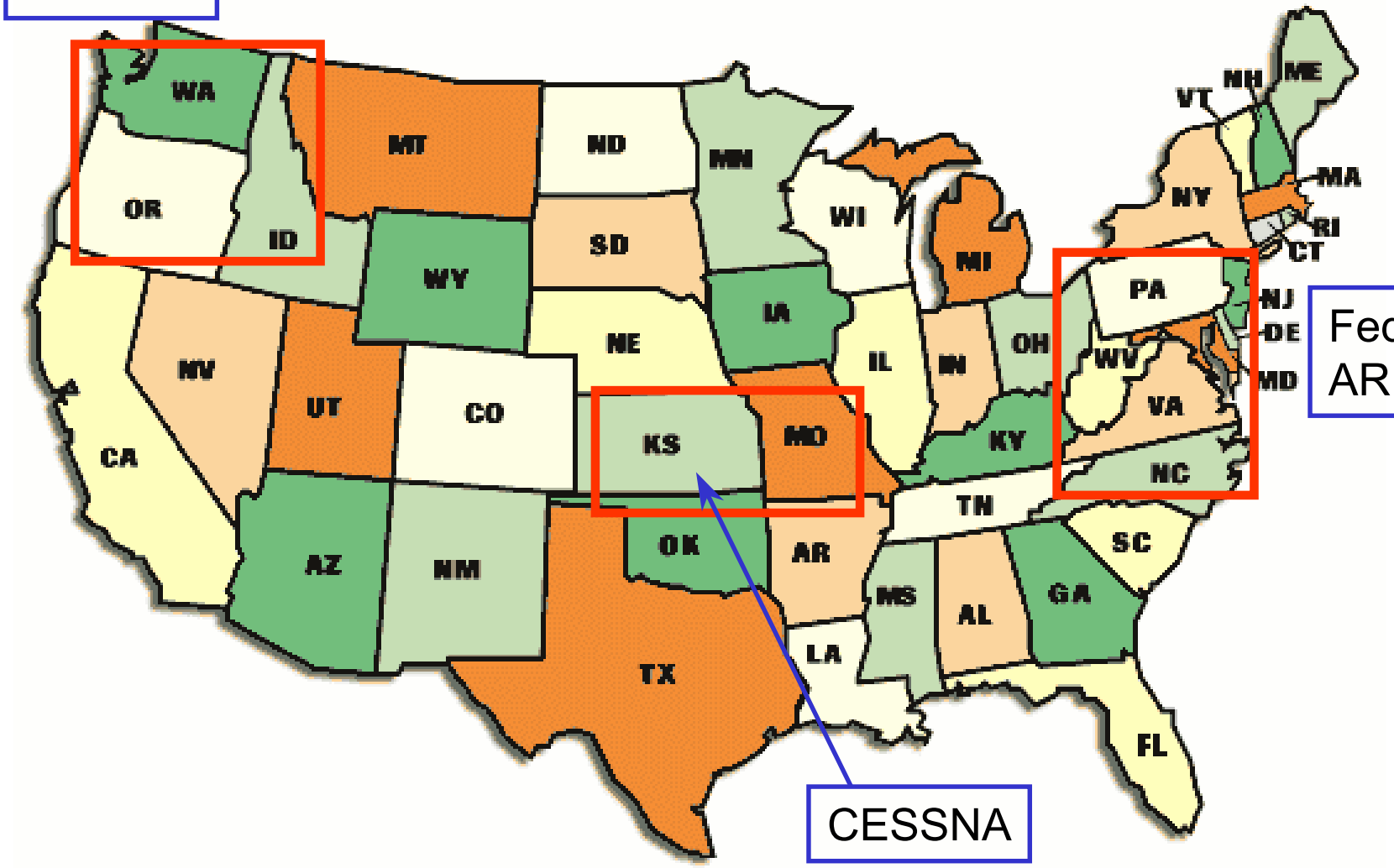
Elements of ARNAV AWIN CRA were Flight Tested in over 40 aircraft

- 3 Cessna owned Aircraft (Piston & Jet)
- 4 Fed-X C-208B Caravans (T-Prop)
- 4 Virginia State DOT aircraft (T-prop & Jet)
- 1 FAA Tech Center Aircraft (Piston)
- 10 ARNAV Aircraft (Piston)
- 21 Civil Air Patrol aircraft (Piston / T-Prop)

Fed-x
ARNAV
CAP / ID

AWIN Flight Test Ranges

1. WA-OR 2. Kansas 3. PA-VA



Fed-x
ARNAV

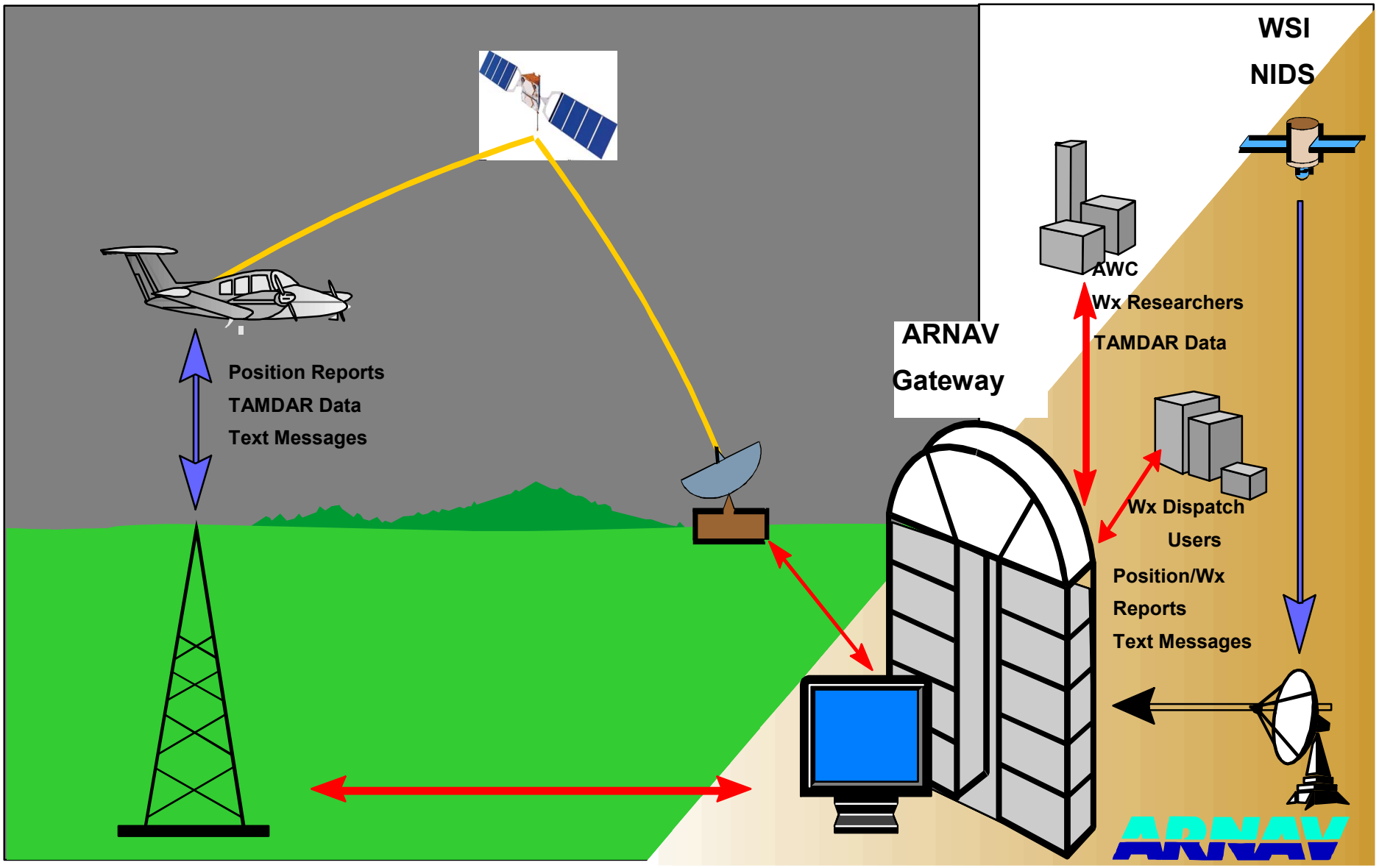
AWIN Goals 2002

- Conduct three scheduled flight tests in 2002
- Transmit advanced Wx products over VHF and Satellite networks, including integrated icing product
- Generate TAMDAR messages with variable intervals based on delta time, distance, or altitude
- Test link loading, ground reception, and distribution of TAMDAR data to Weather researchers.
- Assist NASA TAMDAR team in the integration of the TAMDAR sensor into GA aircraft.

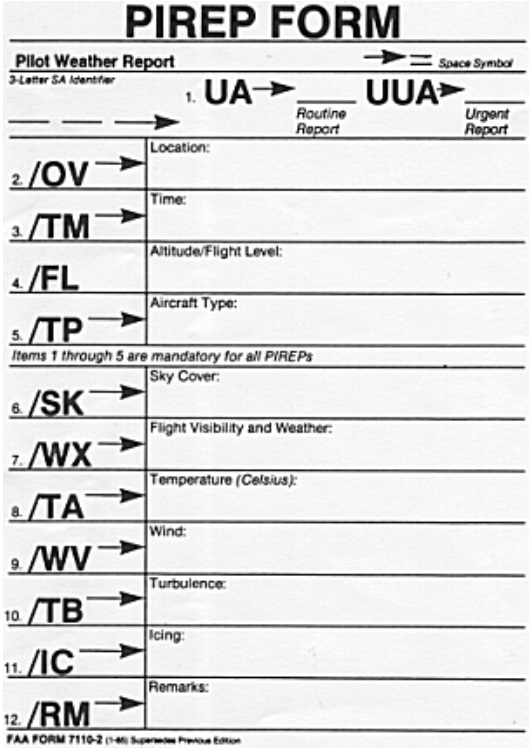
Equipment - ARNAV Flight Test Aircraft

- MFD Display
- GPS
- VHF Two-WAY
- VHF One-WAY
- SAT COMM

VHF and Satellite Communication Architecture



- 1. Simulated the TAMDAR sensor data on GA aircraft
- 2. Presented menu driven PIREP page to provide cueing for standard PiREP elements
- 3. Flight testing TAMDAR Sensor Mid November, 2002



PIREP FORM

Pilot Weather Report

3-Letter SA Identifier

1. UA → Routine Report UUA → Urgent Report

2. /OV → Location:

3. /TM → Time:

4. /FL → Altitude/Flight Level:

5. /TP → Aircraft Type:

Items 1 through 5 are mandatory for all PIREPs

6. /SK → Sky Cover:

7. /WX → Flight Visibility and Weather:

8. /TA → Temperature (Celsius):

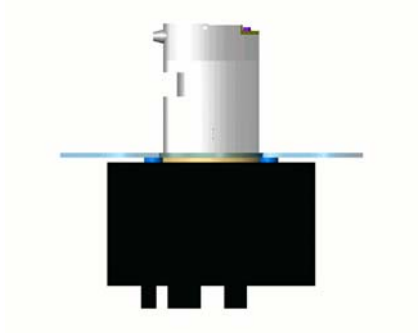
9. /WV → Wind:

10. /TB → Turbulence:

11. /IC → Icing:

12. /RM → Remarks:

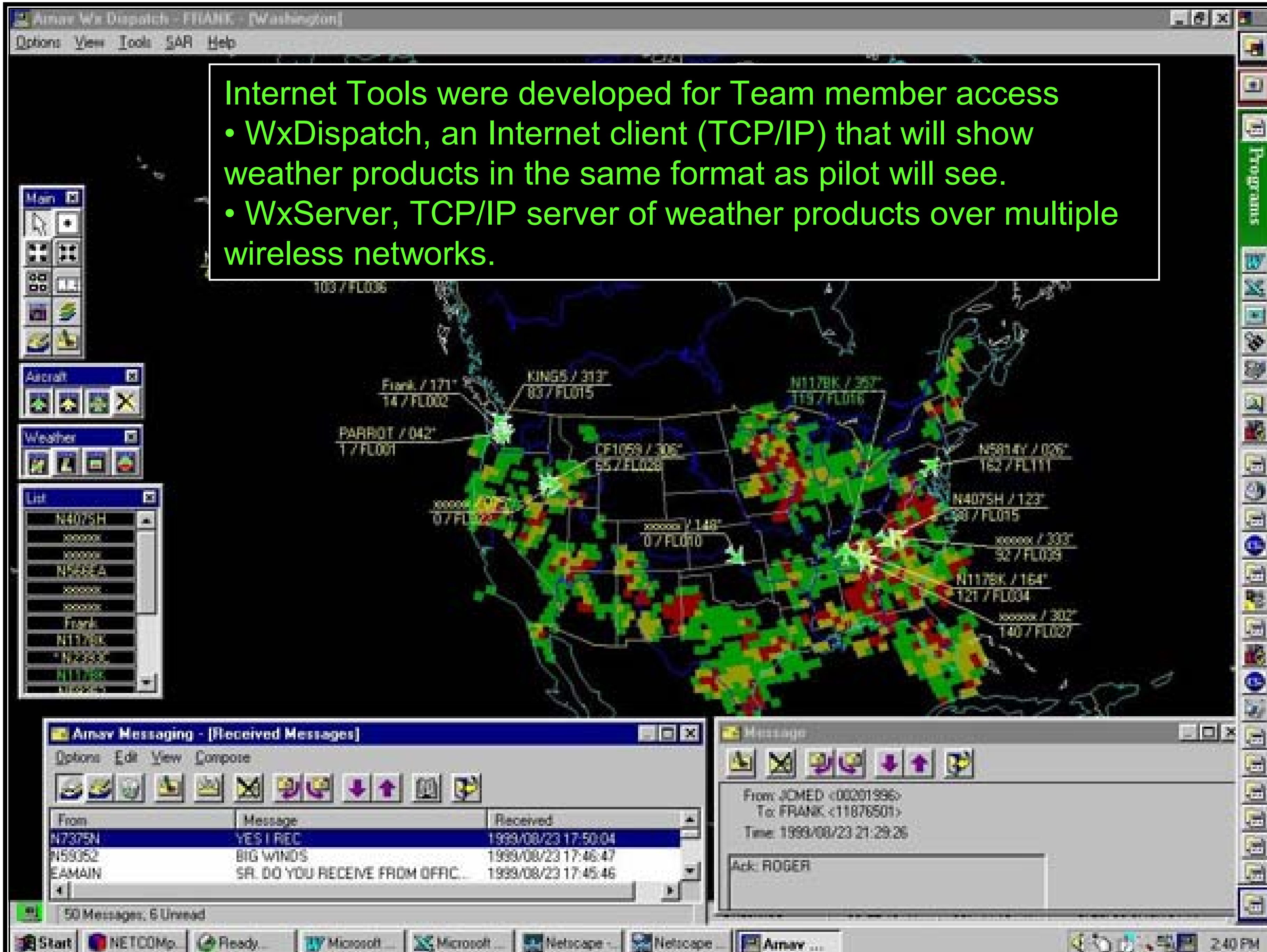
FAA FORM 7110-2

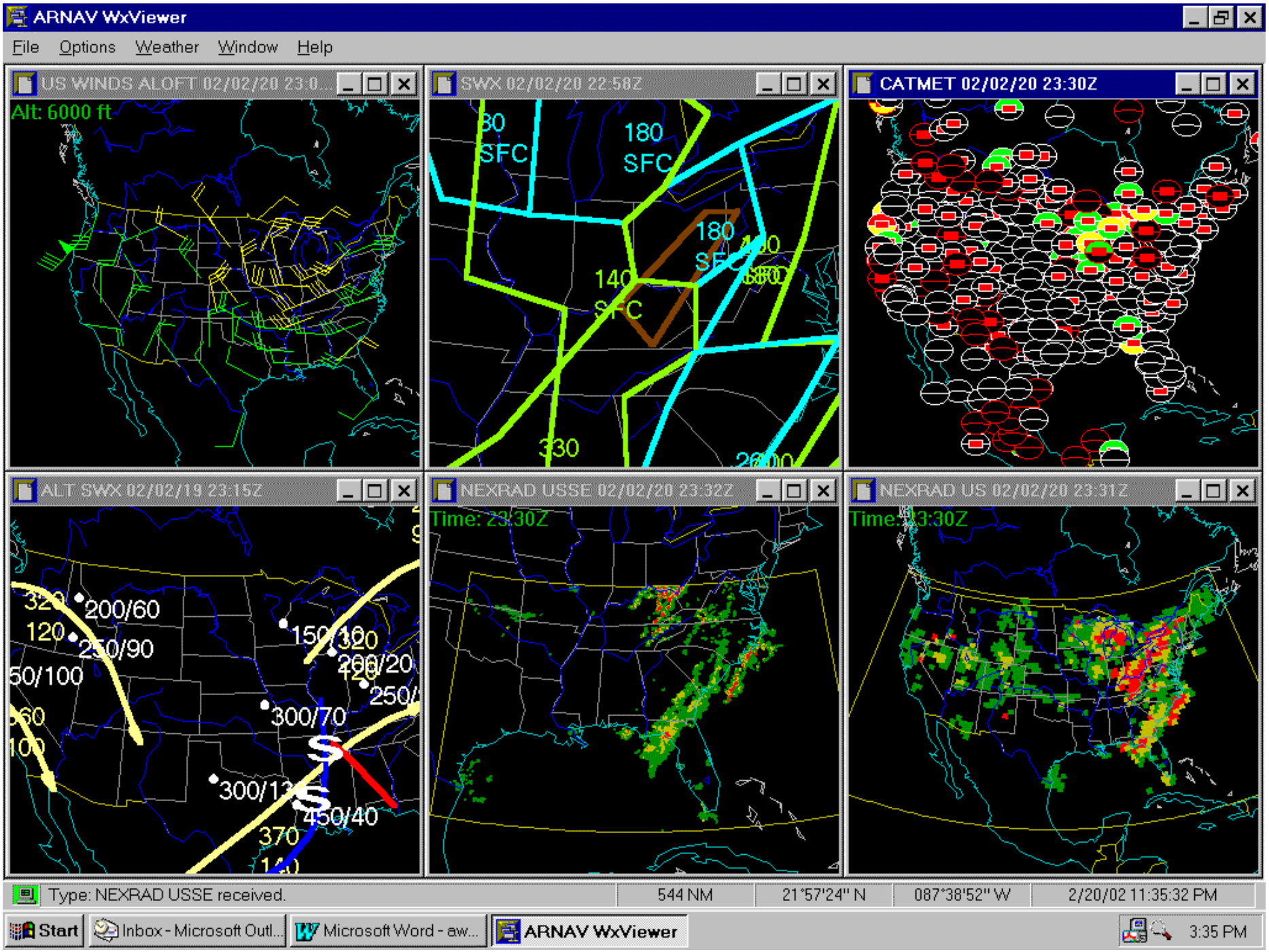


TAMDAR sensor

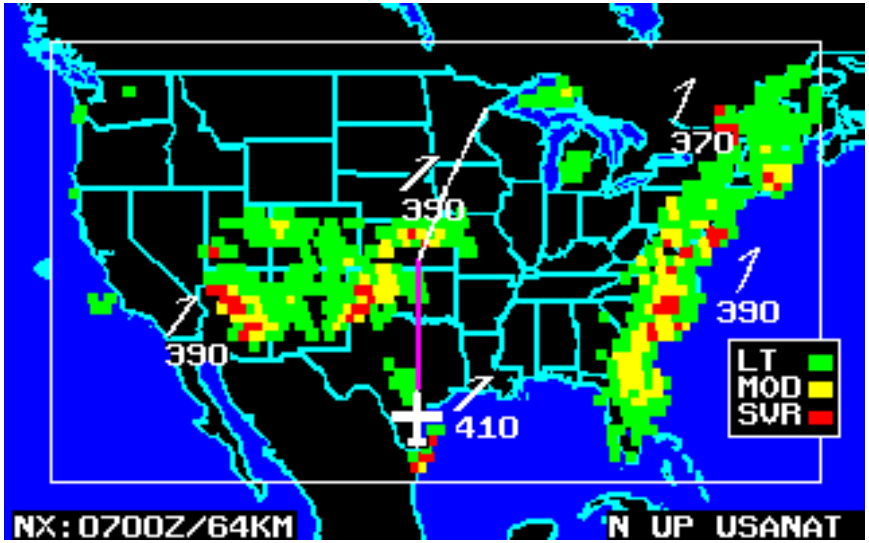
Internet Tools were developed for Team member access

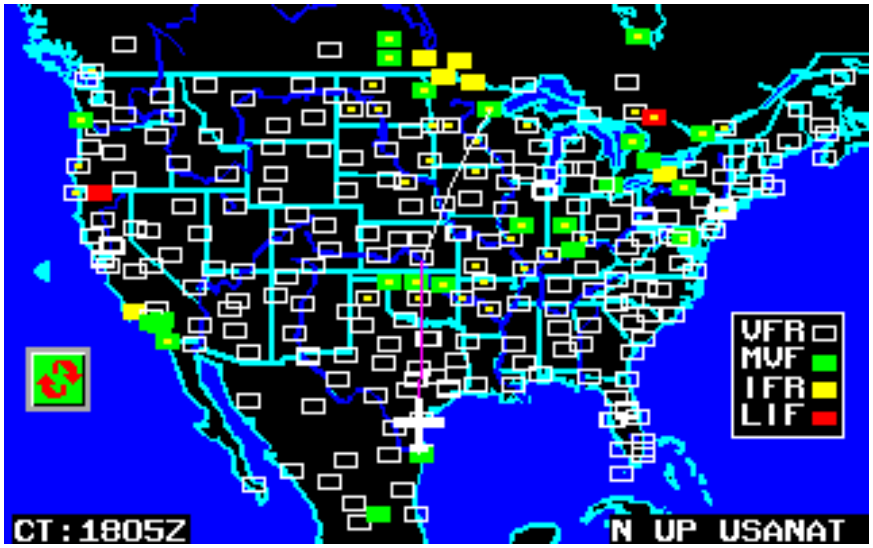
- WxDispatch, an Internet client (TCP/IP) that will show weather products in the same format as pilot will see.
- WxServer, TCP/IP server of weather products over multiple wireless networks.

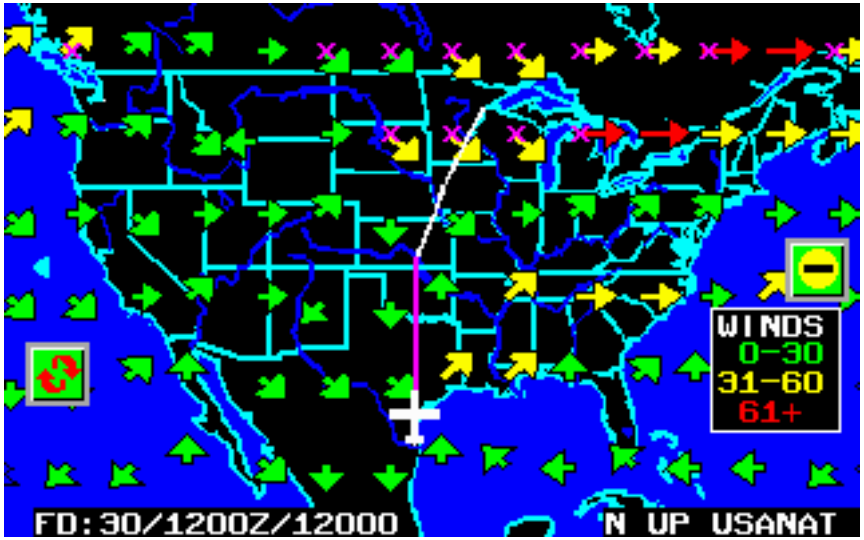


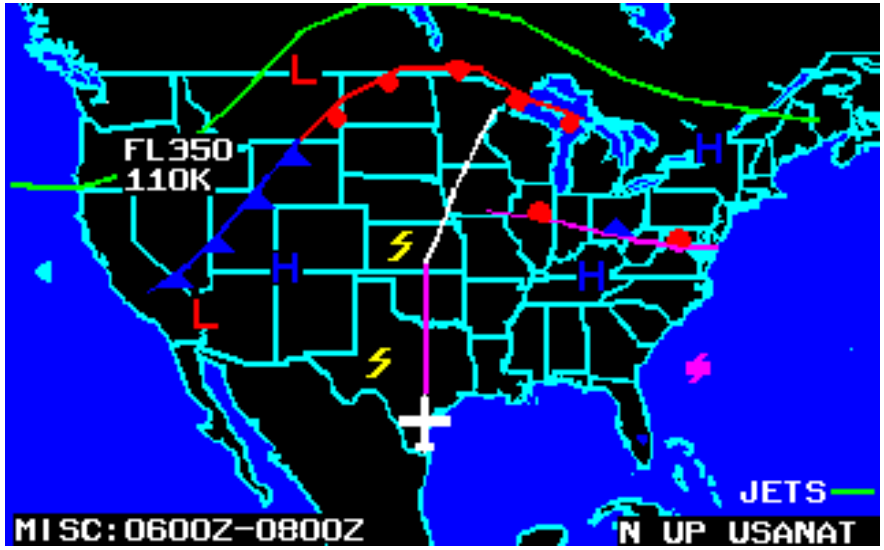

ARNAV WxViewer
File Options Weather Window Help
US WINDS ALOFT 02/02/20 23:0
Alt: 6000 ft
SWX 02/02/20 22:58Z
180 SFC
140 SFC
330
CATMET 02/02/20 23:30Z
ALT SWX 02/02/19 23:15Z
200/60
120
250/90
50/100
150/120
200/20
300/70
300/13
450/40
370
NEXRAD USSE 02/02/20 23:32Z
Time: 23:30Z
NEXRAD US 02/02/20 23:31Z
Time: 23:30Z
Type: NEXRAD USSE received.
544 NM
21°57'24" N
087°38'52" W
2/20/02 11:35:32 PM
Start
Inbox - Microsoft Outl...
Microsoft Word - aw...
ARNAV WxViewer
3:35 PM

National Weather Products

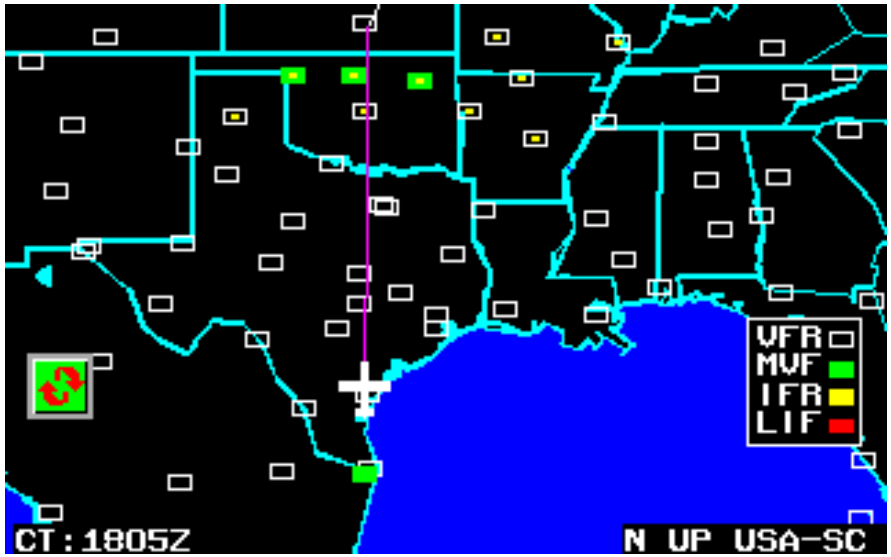


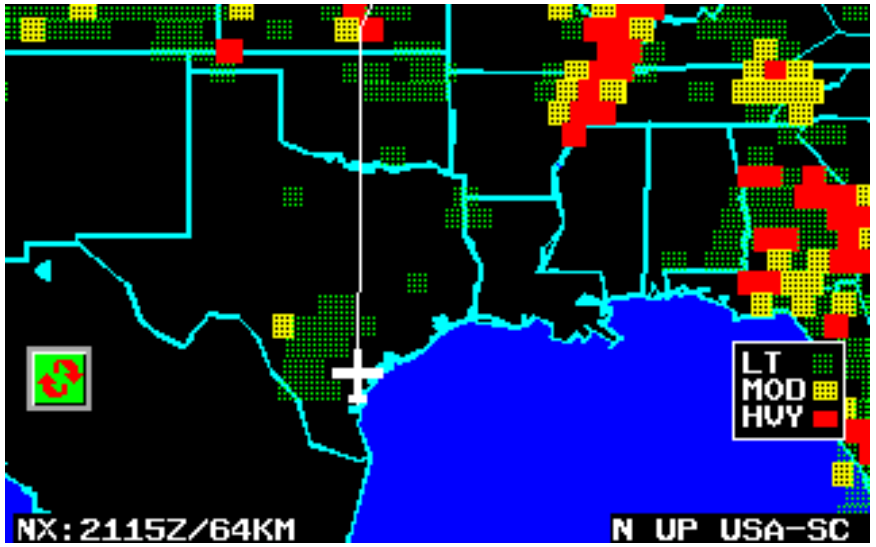


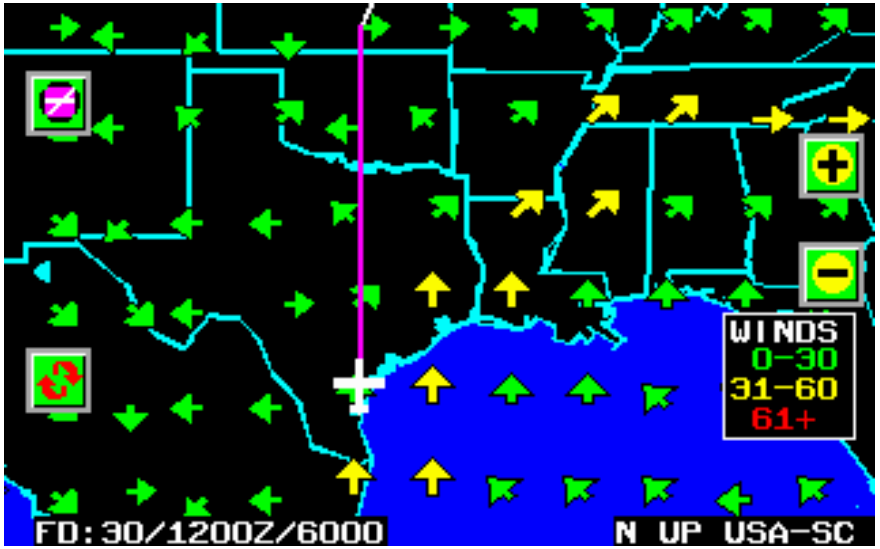


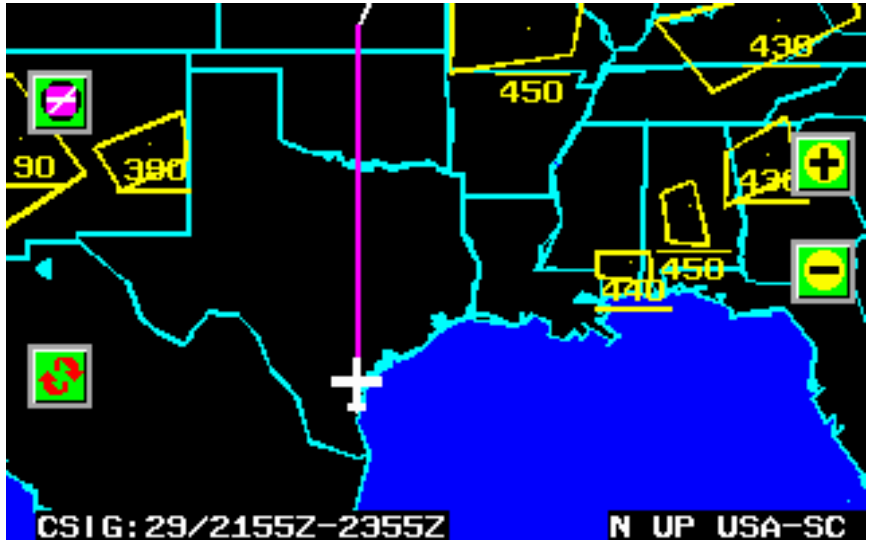


Regional Weather Products









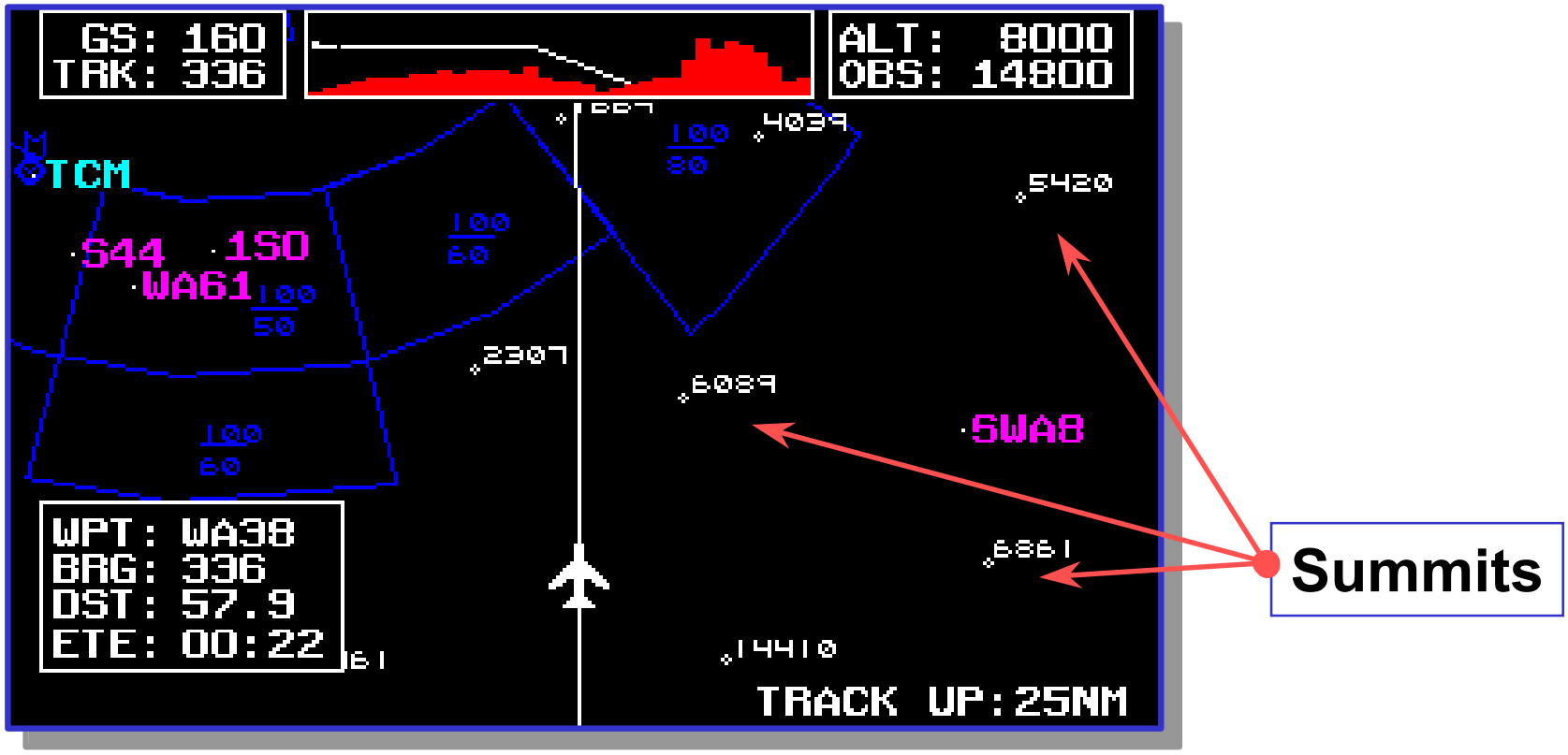
Graphical METAR

- The METAR products are compressed and transmitted to the aircraft Multi-function Display.
- The display format was designed to offer an intuitive synopsis of surface conditions, with text of METAR available with single button press.

(Terrain / Obstruction Proximity System TOPS)

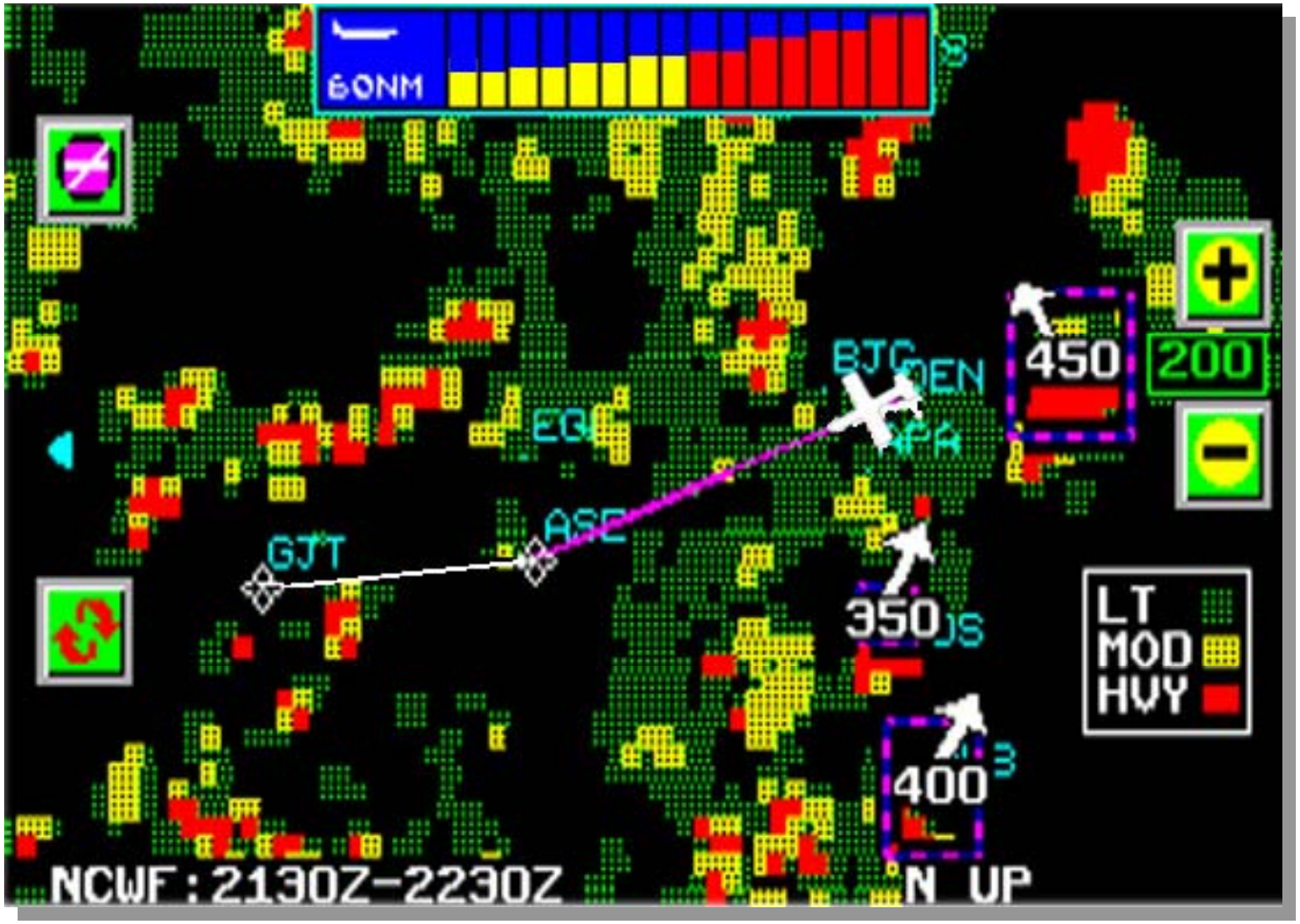
- Controlled Flight into Terrain (CFIT) is the result of loss of spatial awareness.
- Terrain data based on digital elevation model (DEM) spaced at 30-arc seconds
- Airports, Navigation aids (VOR's, NDB's), Maximum Elevation Figures, Summits, Man-Made obstacles, and terrain database used in the TOPS algorithms

The TOPS **look-ahead** mode projects a 5 nautical mile wide line 60 nautical miles along the track of the aircraft, and compares obstacle with the aircraft altitude.



AWIN Flight Testing demonstrated Situational awareness to terrain, airspace and weather

TOPS, NCWF, and NEXRAD



Further studies?

- FAA certification requirements for the use of TAMDAR derived data in the National Airspace System (NAS).
- Installation, calibration, and verification of TAMDAR sensor data? Who pays? Motive?
- How does TAMDAR data get back to AWC in an official capacity for re-dissemination to users?
- Downloadable version of WxDispatch.exe is available at **www.arnav.com**